
Preface

The process of verifying hearing aid performance has undergone significant changes over the past few decades. Between 1950–1970 the most common method to verify hearing aid performance was the comparative procedure advocated by Carhart in 1946. The next major step was the introduction of functional gain as advocated by Dave Pascoe in 1978 to measure the benefit provided by amplification. These two methods, either independent or combined with each other were the most popular methods for assessing the performance of hearing aids until real ear analyzers became commercially available in the 1980s.

Although the audiologist or hearing aid dispenser is capable of making numerous measures with real ear analyzers, the most widely used measure has been the real ear insertion response (REIR) because of the wide availability of REIR prescriptive targets such as NAL-R, POGO, Libby and Berger. Using this equipment, the audiologist or dispenser enters the audiometric thresholds and then the real ear analyzer quickly generates a “prescribed” REIR target. The audiologist then measures the REIR to determine if the measured REIR “matched” the prescribed REIR. This would then serve to “validate” that the hearing aid fitting was appropriate for the patient.

An alternative to the REIR is the real ear aided response (REAR). Instead of looking at the relative performance (i.e., *gain*) of the hearing aid, the REAR measures the *absolute* (i.e., *output*) performance of the hearing aid. Currently, the REAR is most commonly used to determine if intermodulation distortion is present in the hearing aid. Using this procedure, a *family* of REAR frequency response curves are generated in response to increasing levels of the input signal. If the curve at the highest input is as *smooth* as the curve at the lowest input level, then it is concluded that intermodulation distortion is not present. However, if the curve at the higher input level is *jagged*, then it is concluded that the hearing aid is yielding excessive amounts of intermodulation distortion. Another common use of the REAR is to determine the output of the hearing aid in response to a 90 dB input (RESR₉₀) to be sure that this output does not exceed the judgment by the patient that the sound is uncomfortably loud.

Recently, there has been an increased effort to use real ear equipment and the REAR to measure the performance of hearing aids. Several companies have introduced (i.e., Qualitone Prophet; Madsen Aurical) or plan to introduce (i.e., Resound RELM) equipment which measures threshold, most comfortable loudness level (MCL) and the loudness discomfort level (LDL) *in dB SPL* (not in dB HL as is typically done) near the eardrum in response to signals delivered via earphone, loudspeaker or an insert receiver. Once this *individually measured auditory area* has been mapped, the performance of the hearing aid is determined by observing if the measure REAR to a *soft* input level (i.e., 50 dB SPL) is *above* the measured threshold and if the measured REAR for a *loud* input level (i.e., 85 dB) is *below* the measured LDL. In other words, the prescriptive target using this approach is the individually measured auditory area and positioning the output of the hearing aid within this auditory area for soft, average and loud speech.

This fourth issue of *Trends in Amplification* is dedicated to providing the reader with a better understanding of how real ear equipment may be used in a different way to measure the performance of hearing aids. This may offer the reader the opportunity to determine if this method offers significant advantages over the traditional method of using the REIR to measure the performance of hearing aids. The future will require extensive research to determine if this method of assessing hearing aid performance results in significantly better user satisfaction than current methods.

The primary author of this issue is Larry Humes, Ph.D. Dr. Humes is Professor and Chair of the Department of Speech and Hearing Sciences at Indiana University in Bloomington, Indiana. Dr. Humes’s

curriculum vitae lists 101 publications and 129 presentations between 1977–1996. He is well-respected in the United States and around the world for the care in which he approaches and reports his research. The co-authors (Chas Pavlovic, Ph.D., Victor Bray, Ph.D., and Michele Barr, M.A.) are a fine group of researchers at Resound Corporation in Redwood City, California who have worked with Dr. Humes over the past several years in refining this procedure in order to make it clinically applicable.

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